

portion is called "free" water, to distinguish it from the remaining "unfree" water. The portion of the latter capable of being frozen is regarded as capillary-adsorbed, while that which does not freeze at all is the combined water or the water of solid solution and of hydration.

The physiological and ecological significance of such a classification is indicated by showing that a close relationship exists between the unfree water and the wilting coefficient of BRIGGS and SHANTZ, and between the combined water and the hygroscopic coefficient. The new classification, together with the relationship of the different classes of soil moisture to plants, may be concisely expressed as follows, gravitational water being the same as in older systems of classification:

- | | |
|-----------------------|--|
| 1. Gravitational..... | superavailable |
| 2. Free..... | very available |
| 3. Unfree | { Capillary-adsorbed.....slightly available |
| | { Combined { water of solid solution }.....unavailable |
| | { water of hydration } |

The method of measuring the relative amounts of these various forms of water in the soil is known as the dilatometer method, and is relatively simple, being based upon the expansion of water upon freezing. This method would also seem to offer a convenient, rapid, and accurate method of determining the wilting coefficient.—GEO. D. FULLER.

Nutrients for *Rhizopus*.—Miss DUNN¹⁵ has studied the effect of various concentrations and proportions of nutrients upon BLAKESLEE'S two races (male and female) of *Rhizopus nigricans*. The salts KH_2PO_4 , NH_4NO_3 , MgSO_4 , and FePO_4 were used in various proportions, and total concentration with glucose or glycerine as the carbon source. Apparently calcium is not needed by this plant, and it makes no use of nitrate as a nitrogen source, but uses the NH_4 ion. Under the conditions of this investigation "the activity of the organisms appears clearly to be controlled by a combination of (a) salt proportions (or perhaps ion proportions), (b) total salt concentration, and (c) dextrose concentration. When these three conditions are poorly balanced for the growth of these races, the solution may sometimes be greatly improved by altering just one of the conditions, but it is frequently necessary to alter two conditions simultaneously to obtain good physiological balance. The solution representing the best combination has the following characteristics: (a) Molecular salt proportions: KH_2PO_4 6.0: NH_4NO_3 1.0: MgSO_4 1.1: FePO_4 a mere trace. (b) Total salt concentration, equivalent to a calculated osmotic value of 14.5 atmospheres. (c) Dextrose concentration, 1.0 gram-mol. per liter." There was no consistent difference in dry weight production between the male and female races when grown on dextrose, but when grown with glycerine as the

¹⁵ DUNN, GRACE A., A comparative study of the two races of *Rhizopus nigricans*. *Physiol. Researches* 2:301-339. 1921.

carbon source, the male uniformly gave the higher yield. In all dextrose cultures where the yields were medium or high, the male showed much more sporangium production than the female, and the female was more vigorous in mycelial production. The male seems to have a somewhat higher maximum temperature than the female. The optimum for the female also seems to be somewhat lower.—WM. CROCKER.

Amylase of *Rhizopus*.—HARTER¹⁶ has made a study of the amylase of *Rhizopus tritici*, particularly the effect of various factors on its secretion and action. The best growth of the fungus, and also secretion of amylase, as indicated by the amount of hydrolysis of starch, was obtained with CZAPECK'S nutrient solution, when ammonium nitrate was the source of the nitrogen; and starch the source of the carbon. Poorer results were obtained when sodium nitrate was used as the source of the nitrogen, and either cane sugar or glucose as the carbon source. Sweet potato bouillon, however, which contained both glucose and starch, gave the best results of all. The nutrient solution best for the growth of the fungus was also best for the secretion of the enzyme. The best temperature for the action of the enzyme was 45° C., and its action was practically nil at 60°. The secretion of the enzyme, as measured by the hydrolytic power of a unit weight of the enzyme powder, was much less when the fungus was grown at 40° C., the maximum temperature for its growth, than when it was grown at 9° C., which represents about the minimum temperature for its growth. While most of the experiments, the data from which are recorded in this paper, have been tried out by other workers, using other species of fungi, this seems to be the first time that *Rhizopus tritici* has been used for such an investigation.—S. V. EATON.

Plants of Mississippi.—The greater part of a useful little volume by LOWE¹⁷ is occupied by an annotated list of the vascular plants of Mississippi, compiled from the ALLISON and TRACEY herbaria and from the field work and collections of the author and his assistant, THOMAS L. BAILEY. A feature of the work which should appeal to the general reader is an introduction comprising an elementary discussion of the problems of plant ecology expressed in non-technical language. Botanists will be more interested in the division of the state into the ten following topographic and floristic regions: (1) Tennessee River hills, (2) Northwestern prairie belt, (3) Pontotoc ridges, (4) Flatwoods, (5) North central plateau, (6) Jackson prairie belt, (7) Loess or bluff hills, (8) Yazoo-Mississippi delta, (9) Long leaf pine belt, (10) Coastal pine meadows. The topography, soil, and vegetation of each of these subdivisions are briefly described and lists of characteristic species given. The usefulness of the volume would be decidedly increased by supplementing the table of contents with an adequate index.—GEO. D. FULLER.

¹⁶ HARTER, L. L., Amylase of *Rhizopus tritici*, with a consideration of its secretion and action. Jour. Agric. Res. 20:761-786. 1921.

¹⁷ LOWE, E. N., Plants of Mississippi. Miss. Geol. Surv. Bull. 17. pp. 292. 1921.